Siting Nuclear Power Plants in Australia

Where would they go?

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Summary

If the Federal Government decided to promote the establishment of a nuclear energy industry in Australia, the siting of the power plants is likely to be one of the most politically contentious issues. Overseas evidence suggests that even in countries that rely on nuclear power for a large proportion of their electricity needs, there is a considerable amount of community opposition to the nuclear industry and siting issues are often a source of conflict.

In Australia, half of the population opposes nuclear energy and two thirds say they would oppose a nuclear power plant in their local area. Given this, in order for there to be a thorough and full-blooded debate about nuclear energy, it is necessary to identify the sites that are best suited to nuclear power plants.

Using four primary criteria, 19 locations are identified as the most likely sites for nuclear power plants. Seven secondary criteria are then used to identify potential issues at these sites. The selected sites reflect broad geographic areas rather than specific locations.

The selected sites are:

- in Queensland – Townsville, Mackay, Rockhampton, Gladstone, Bundaberg, Sunshine Coast and Bribie Island;
- in New South Wales and the Australian Capital Territory – Port Stephens, Central Coast, Botany Bay, Port Kembla and Jervis Bay/Sussex Inlet;
- in Victoria – South Gippsland, Western Port, Port Phillip and Portland; and
- in South Australia – Mt Gambier/Millicent, Port Adelaide and Port Augusta/Port Pirie.

1. Introduction

In May 2006, the Prime Minister called for a 'full-blooded' debate about the establishment of a nuclear power industry in Australia (ABC 2006). Soon after he announced that Cabinet had approved the establishment of a Prime Ministerial Taskforce to review uranium mining, processing and nuclear energy in Australia (hereafter referred to as the 'Nuclear Taskforce') (Howard 2006a).

The reasoning provided for the review was that it was 'foolish' for Australia to merely be an exporter of uranium without looking into whether it could also support an enrichment and nuclear power industry (Howard 2006a). While the Prime Minister anticipated there would be opponents to the idea of expanding Australia's nuclear industry, he stated that he wanted a 'full and open review, and examination, and debate on this issue' (Howard 2006a).

The announcement that the Federal Government was looking into whether there should be an expansion of the nuclear industry in Australia sparked a strong reaction from opposition political parties and some environment groups. Almost immediately a central part of the debate became the possible location of power plants. For example, the former Leader of the Opposition, the Hon. Kim Beazley MP, stated in late May 2006:

> [w]hich suburbs will be home to the new nuclear reactors? What will he do to ensure local residents and schools are safe? Will there be nuclear reactors in each major city, or just Sydney? (Peatling and Frew 2006)

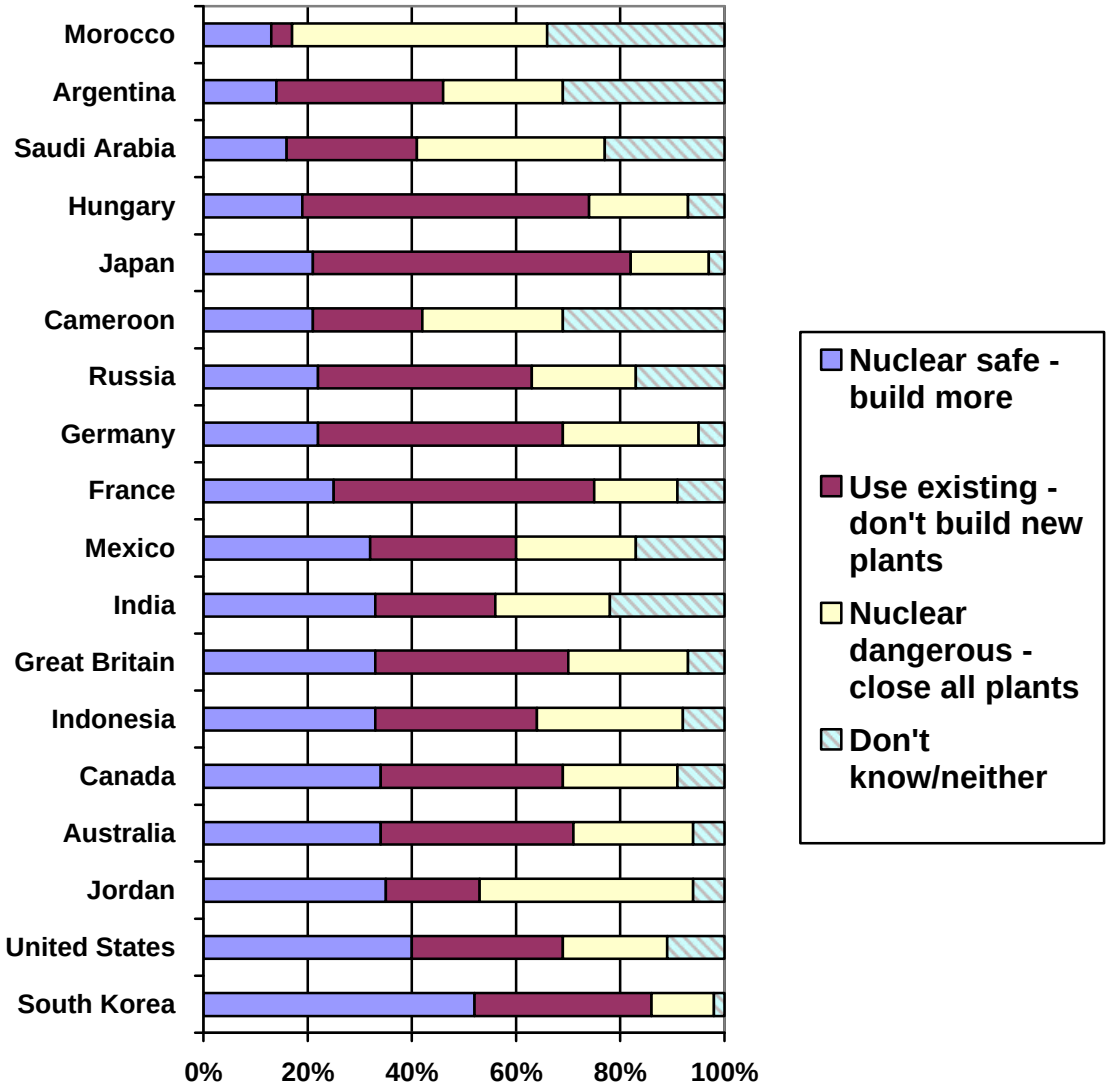
Not long after assuming the leadership of the Federal Labor Party in late 2006, Kevin Rudd flagged that the siting of nuclear power plants was likely to remain at the centre of the current nuclear debate. In response to questioning from the media about public support for nuclear energy in December, he stated that:

> Mr Howard is now talking about 25 nuclear reactors for the country. He has to answer the question about where are they going to go and we know from previous scientific reports that a large number would have to go near the coastline (Lewis and Kerr 2006).

The fact that potential locations for power plants have become a focal point of the debate is consistent with the events and research from overseas. Surveys have consistently shown that people are anxious about the risks associated with nuclear power. These survey results have been found in countries that have substantial nuclear power industries, as well as those that do not.[1] For example, in Japan and France, both of which rely on nuclear power for a large proportion of their electricity, two thirds of the populations oppose the construction of new nuclear power plants (see Figure 1).

[1] See, for example, Clark *et al.* (1997); Hopkins (2005); GlobeScan Incorporated (2005); Newspoll (2006; 2007); and Macintosh (2007).

Figure 1 Support for nuclear power



Source: GlobeScan Incorporated (2005).

Concerns about the safety of nuclear power plants have led to ongoing opposition to nuclear energy and calls for the closure of existing nuclear facilities in some countries. As Figure 1 shows, a sizeable proportion of the population in all 18 countries that were surveyed on behalf of the International Atomic Energy Agency in 2005 believe nuclear energy is dangerous and support the closure of all existing nuclear power plants. Further, the survey found that in all countries other than South Korea, more people either support the closure of all existing nuclear power plants or oppose new builds than support the construction of new nuclear power plants.

When overseas debates have turned to the siting of new power plants, there has tended to be fierce opposition from people in areas that are viewed as suitable locations.[2] This has stifled the expansion of the nuclear power industry and affected the manner in which nuclear power plants have been sited and operated. For example,

[2] See Kunreuther *et al.* (1996); Shaw (1996); Lesbirel and Shaw (2000); Lesbirel (2003); Sumihara (2003); and Aldrich (2005).

since the 1960s local resistance has meant that it has been almost impossible to construct new nuclear power plants in Japan at sites that do not already have similar facilities. This has meant that new facilities have tended to be sited alongside pre-existing nuclear developments (Lesbirel 2003). To overcome opposition to nuclear power in Japan a number of elaborate schemes have been put in place, including laws that provide compensation to communities that have nuclear facilities in their local areas (Sumihara 2003; Aldrich 2005). Similar siting problems in the US and some European nations have contributed to a situation where private operators have been precluded from owning and operating nuclear power plants (Kunreuther *et al.* 1996). Further, no new power plants have been constructed in Europe or the United States for over a decade, although two are currently in the pipeline in Europe (UMPNERT 2006).

The fact that nuclear energy attracts moderate levels of support at a general level but fierce opposition from local communities when concrete proposals are put forward suggests the presence of the NIMBY (not in my backyard) phenomenon. That is, even if people do not oppose nuclear power plants at a general level, they often object to proposals to construct them in their local areas. Recent research by Newspoll and the Australia Institute suggests that a significant proportion of the population who support nuclear power plants being built in Australia are likely to oppose plans to build them in their local area.[3] For example, a Newspoll survey published in *The Australian* in December 2006 found that 35 per cent of people support nuclear power plants being built in Australia (Lewis and Kerr 2006; Newspoll 2007). However, a survey conducted by Newspoll on behalf of the Australia Institute found that only 25 per cent of Australians support a nuclear power plant in their local area (Macintosh 2007).

Part of the NIMBY phenomenon associated with nuclear energy is probably due to the way people evaluate risks. Research from Japan found that when people assess the value of nuclear power at a general level, they weigh both the perceived risks and potential benefits. Yet when it comes to a siting situation, perceived risks become the overriding factor and the weighting given to potential benefits is greatly diminished (Tanaka 2004).

The degree of concern about nuclear power suggests that the domestic debate about establishing a nuclear energy industry must consider possible locations for power plants. At the most basic level, the public cannot accurately evaluate whether it is willing to support a nuclear industry unless it has an idea about where the power plants are likely to be located. In the absence of this information, the Government is asking the community to make decisions in the abstract without being fully informed.

Further, from a practical perspective, if the Government wants to proceed with the establishment of a nuclear industry, early identification of potential sites provides decision-makers with a greater opportunity to persuade the relevant communities to support the construction of nuclear power plants in their local areas. In addition, local opposition to siting decisions is likely to have a profound impact on the manner in which any future nuclear industry develops, meaning that it is critical that siting issues are discussed at the earliest possible opportunity.

[3] See Newspoll (2006; 2007); Lewis and Kerr (2006); and Macintosh (2007).

To further the debate about the role that nuclear power should play in Australia, this paper provides several criteria for siting nuclear power plants and identifies sites where nuclear power plants could be located. Section 2 provides background on issues that are relevant to the siting of nuclear power plants. Section 3 explains the criteria used for identifying suitable sites for nuclear power plants. Section 4 lists the sites that best meet the criteria and Section 5 discusses implications.

2. Background

In its final report released in December 2006, the Nuclear Taskforce identified two alternative scenarios related to the development of nuclear power in Australia: a fast build case and a slow build case (UMPNERT 2006). The fast build case involves bringing the first nuclear power plant into operation in 2020 and then additional capacity is added from 2025 until total nuclear power capacity reaches 25 gigawatts (GW) in 2050. Under the slow build case, the first nuclear power plant begins operation in 2025, additional capacity is added from 2030, and total capacity reaches 12 GW in 2050.

Any attempt to establish a nuclear power industry in Australia is likely to confront a number of hurdles, many of which are discussed in the Nuclear Taskforce's report. They include the following issues.

- Nuclear power does not currently appear to be competitive with fossil fuel-based electricity generation. For nuclear power to compete in the electricity market it would have to be subsidised or a price would have to be placed on greenhouse emissions. The Nuclear Taskforce has indicated that with a price for greenhouse emissions of between $15 – 40 per tonne of carbon dioxide equivalent (CO_2-e), nuclear power would become competitive with coal-based generation. In December 2006, the Prime Minister announced the establishment of a 'joint government business Task Group to advise on the nature and design of a workable global emissions trading system in which Australia would be able to participate' (Howard 2006b). It is unclear whether this will ultimately lead to the introduction of a system that places a price on greenhouse emissions in Australia.

- There are significant financial risks associated with investing in nuclear power plants, including long lead times and political and regulatory uncertainty. This can increase the cost of capital for nuclear power projects.

- Australia does not currently have an appropriate system for regulating nuclear power plants. Before nuclear power plants are constructed, a regulatory system would have to be created.

- Establishing a nuclear power industry could require augmentation of the transmission network and an increase in the reserve capacity to allow large generators to be taken off-line for refueling.[4] This would increase the cost of nuclear energy and delay its introduction.

[4] Whether augmentation of the transmission network and an increase in reserve capacity are required will depend on the size of the nuclear power plants and where they are located. The largest generating

- Surveys indicate that there is a considerable amount of community opposition to the establishment of a nuclear power industry in Australia.

Given these factors, it seems unlikely that the fast build scenario identified by the Nuclear Taskforce will be achieved. If the Federal Government decides to proceed with the establishment of the nuclear industry, it is more likely that the slow build case will be followed.

Due to economies of scale, the state of nuclear technology[5] and the nature of Australia's electricity system, if nuclear reactors were constructed in Australia they are likely to have a capacity of approximately 1,000 megawatts (MW). Consequently, if the slow build case is implemented, it would require the construction of approximately 12 nuclear power plants in order to meet the projection of 12 GW of electricity from nuclear power in 2050.

The following section sets out several criteria for the siting of nuclear power plants in Australia.

3. Siting criteria

In siting a nuclear power plant, there are two main objectives:

- ensuring the technical and economic feasibility of the plant; and
- minimising potential adverse impacts on the community and environment.[6]

To account for these objects, two sets of criteria have been developed. The primary criteria are concerned with the technical and economic feasibility of nuclear power plants. The secondary criteria relate to the risks that nuclear power plants pose to the community and environment.

3.1 Primary criteria

There are four primary criteria for the siting of nuclear power plants in Australia:

- proximity to appropriate existing electricity infrastructure;
- proximity to major load centres (i.e. large centres of demand);
- proximity to transport infrastructure to facilitate the movement of nuclear fuel, waste and other relevant materials; and
- access to large quantities of water for cooling.

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units in the NEM at the moment are 660 MW, although the Kogan Creek coal-fired power station in Queensland will be 750 MW when completed in 2007. In contrast, the current generation of nuclear power plants tend to be at least 1,000 MW. However, some countries are currently experimenting with smaller nuclear power plant technology (UMPNERT 2006).

[5] Designs for smaller power plants are currently being developed. However, as the Nuclear Taskforce notes, 'these may not be commercialised for some years' (UMPNERT 2006, p. 50).

[6] For discussion of general siting considerations, see Kirkwood (1982); USNRC (1998); ARPANSA (1999); STUK (2000); IAEA (2003); and USCFR (2003).

Electricity infrastructure

Australia has a number of electricity systems or grids. The largest of these provides electricity for the National Electricity Market (NEM), which operates on the longest interconnected power system in the world (NEMMCO 2005a). The NEM's electricity system runs down the east coast of Australia, from Port Douglas in Queensland to Port Lincoln in South Australia, and now down to Tasmania via the recently constructed Basslink. It is broken into six interconnected regions (Queensland, New South Wales, Snowy, Victoria, South Australia and Tasmania) and market processes are used to determine the wholesale price of electricity in each of the regions. At present, the NEM is responsible for the delivery of electricity worth around $7 billion to almost eight million end-use customers (NEMMCO 2006).

Over the medium to long term, electricity generation in Australia is expected to grow at a rate of approximately two per cent a year, resulting in a 73 per cent increase in generation between 2003/04 and 2029/30 (Akmal and Riwoe 2005). To meet the demand for electricity, projections suggest Australia will need 100 GW of new generation capacity by 2050, which is more than double the existing capacity (48 GW) (UMPNERT 2006).[7] Data prepared by the Australian Bureau of Agricultural and Resource Economics suggest the overwhelming majority of the increase in generation capacity is likely to occur in the eastern states (Akmal and Riwoe 2005). Given this, it is likely that most (if not all) of the 12 nuclear power plants would be located on or near the NEM. As the report of the Nuclear Taskforce indicates, the sites could be located near existing coal-fired generators on the NEM to take advantage of electricity infrastructure and grid connections (UMPNERT 2006, p. 55).

Criterion A.1

Sites close to the NEM, preferably near existing large generators.

Proximity to load centres

Electricity systems lose energy as electricity is transported through the transmission and distribution networks due to electrical resistance and the heating up of conductors. To account for these transmission losses, generators must produce more electricity than is ultimately consumed. In the NEM, the losses can be up to 10 per cent of the electricity that is conveyed (NEMMCO 2005b), although the loss factors vary significantly between and within regions (NEMMCO 2007).

To minimise transmission losses, nuclear power plants would preferably be located near major centres of demand (called load centres) (UMPNERT 2006, p. 55). This would ensure more efficient delivery of electricity and reduce financial costs. The major load centres are the capital cities and large regional centres, particularly those that have energy-intensive industries (for example, Gladstone, Newcastle and Wollongong).

Criterion A.2

Sites near major centres of electricity demand.

[7] This takes into account the need to retire some of the existing generators.

Proximity to transport infrastructure

In the short to medium term Australia is unlikely to develop commercial conversion, enrichment and fuel fabrication facilities (UMPNERT 2006, p. 42). The market for these services is highly concentrated and integrated and there are significant barriers to entry. As the Nuclear Taskforce has stated:

> [t]he integrated nature of the industry worldwide makes entry difficult. While Australia may have the capability to build an enrichment plant, any such decision would need to be a commercial one. The presumed high returns from enrichment services would need to be balanced against the high barriers to entry and the large technological, economic and political investments required (UMPNERT 2006, p. 42).

Similarly, high capital costs and low returns make it unlikely that Australia will develop reprocessing facilities in the short to medium term (UMPNERT 2006).

Due to these factors, if nuclear power plants were constructed in Australia, it is likely that they would be reliant on imported fuel rods and they may also export spent fuel rods for reprocessing. To reduce financial costs and facilitate the import and export of nuclear fuel and waste, nuclear power plants would preferably be located near suitable transport infrastructure (for example, ports, roads and railway lines).

Criterion A.3

Sites near suitable transport infrastructure.

Access to water

Nuclear reactors operate by using heat from a nuclear reaction to create steam, which then drives turbines to produce electricity. The water requirements to drive the turbines are relatively small because the steam cycle is a closed loop. However, nuclear reactors generally require large volumes of water for cooling purposes.

The amount of water required for cooling purposes depends on the technology that is employed. There are four main types of cooling systems: evaporative cooling; once-through seawater cooling; once-through freshwater cooling; and dry cooling (Rose 2006).

Coal-fired power stations in Australia generally use evaporative cooling. As the name suggests, in evaporative cooling systems the waste heat is discharged into the atmosphere through the evaporation of water. These systems require large volumes of water.

According to a report prepared by Dr Ian Rose for the Queensland Government, evaporatively-cooled large coal-fired power plants use around 1.85 – 2 litres of water per kilowatt hour (L/kWh) (Rose 2006). By comparison, evaporatively-cooled nuclear power plants use around 25 per cent more water, or around 2.3 L/kWh. This suggests that a 1,000 MW nuclear power plant generating 8,000 GWh annually would require

roughly 20 gigalitres (GL) of water each year (equivalent to almost 9,000 Olympic swimming pools).[8]

Rose argues that the preferred option for nuclear power stations would be 'one based on evaporative cooling from a reliable fresh water source' (Rose 2006, p. 4). However, due to the current condition of Australia's freshwater resources, it seems more likely that nuclear power plants would use seawater for cooling purposes. This could involve the use of seawater for evaporative-cooling purposes or once-through cooling.

Once-through cooling systems are cheaper than evaporative cooling systems to construct. However, they require large volumes of water and the temperature of the water that passes through the power plant is raised by several degrees, giving rise to thermal pollution problems. In Australia, once-through freshwater cooling is unlikely due to the current pressure on water resources. Once-through seawater cooling is likely to be preferred due to the availability of seawater and the fact that the hot discharge water would be diluted in the ocean, thereby potentially reducing environmental impacts.

Dry-cooling is another option. These systems operate much like a radiator in a car in that air flow is used to cool water flowing inside tubes or pipes. After the heated water is cooled by the air flow, it is returned to the condenser, thereby creating a closed loop. At the same time, the waste heat from the reactor is discharged into the atmosphere with the air flow.

The advantage of dry-cooling is that it requires significantly less water than a wet cooling system. The major drawback is the additional cost. Dry-cooled power plants are generally more expensive to construct and operate than those that rely on wet cooling systems (Szabó 1998; Rose 2006; UMPNERT 2006). Consequently, to ensure nuclear power plants remain competitive in the energy market, they are likely to rely on wet cooling systems.

Given the above factors, if nuclear power plants are constructed in Australia, they are likely to rely on seawater for cooling purposes. Hence, nuclear power plants would preferably be located in coastal areas to ensure access to seawater.

Criterion A.4

Coastal sites with access to seawater for cooling purposes.

3.2 Secondary criteria

There are a number of potential secondary criteria that are relevant to the siting of nuclear power plants. They include the following.

[8] There are other lower estimates of the water requirements of evaporatively-cooled nuclear power plants. For example, in its submission to the Nuclear Taskforce, Hunwick Consultants Pty Ltd indicated that a 1,000 MW reactor would consume 15 GL per year in evaporation (Hunwick Consultants Pty Ltd 2006). Even if the lower estimates are accepted, the water needs of evaporatively-cooled power plants are substantial.

Population density

Nuclear power plants should preferably be located in sparsely populated areas that are distant from large population centres (USNRC 1998; STUK 2000; IAEA 2003; USCFR 2003). Distance from densely populated areas is necessary to minimise community opposition and security risks and to reduce the complexity associated with emergency planning.

In order to minimise health and safety risks, regulators often require staged buffers around nuclear power plants. For example, in Finland, the Radiation and Nuclear Safety Authority (STUK) has identified three zones. The first zone is the site of the power plant and it extends to approximately one kilometre from the facility. Within this area, permanent settlement is prohibited and the operator of the facility should have authority over all activities carried out in the area. The area can include a public road, but only if the volume of traffic is small and the traffic can be diverted elsewhere in an emergency.

The second zone (known as a protective zone) extends to approximately five kilometres from the facility. Development is restricted in this zone to exclude sensitive activities (for example, hospitals) and high density settlements and prevent unsuitable growth in the number of permanent residents.

The third zone (the emergency planning zone) extends to about 20 kilometres from the facility. Plans are required to be prepared for this area to ensure the evacuation of people in an emergency. Guidelines issued by the Authority state that:

> [t]he emergency planning zone may not contain such populations or population centres as would render impossible the efficient implementation of rescue measures applicable to them (STUK 2000, p. 4).

Similar requirements are contained in the United States (US) Code of Federal Regulation (USCFR 2003) and regulatory guidelines issued by the US Nuclear Regulatory Commission (USNRC 1998). There must be an exclusion area, low population zone (LPZ) and two emergency planning zones (EPZs) (a plume exposure pathway EPZ and an ingestion pathway EPZ). The exclusion area is equivalent to Finland's site area and the LPZ is equivalent to Finland's protective zone. Under the Code, 'the size of the LPZ must be such that the distance to the boundary of the nearest densely populated centre containing more than about 25,000 residents must be at least one and one-third times the distance from the reactor to the outer boundary of the LPZ' (USNRC 1998). The LPZ must also be large enough to ensure that a person located on the outer boundary who was exposed to the radioactive cloud from a postulated fission product release would not receive a radiation dose that exceeds prescribed levels (i.e. in excess of 25 rem to the whole body or a total radiation dose in excess of 300 rem to the thyroid from iodine exposure). The EPZs are the outer zones and have radii that range from around 16 km in relation to the plume exposure pathway EPZ to 80 km for the ingestion pathway EPZ.

Overseas guidelines indicate that the fact that there are residential developments within an area will not necessarily rule it out as a possible site for a nuclear power plant. High density areas will generally be avoided, but medium density areas can be

suitable in certain circumstances. For example, section 100.21(h) of the US Code of Federal Regulation states:

> [r]eactor sites should be located away from very densely populated centres. Areas of low population density are, generally, preferred. However, in determining the acceptability of a particular site located away from a very densely populated centre but not in an area of low density, consideration will be given to safety, environmental, economic, or other factors, which may result in the site being found acceptable. Examples of these factors include … having superior seismic characteristics, better access to skilled labor for construction, better rail and highway access, shorter transmission line requirements, or less environmental impact on undeveloped areas, wetlands or endangered species, etc.

Consequently, to some extent, other factors can be traded-off against population issues when siting nuclear power plants.

Criterion B.1

Sites with adequate buffers to populated areas.

Geological and seismological issues

Geological and seismological factors have an important bearing on the costs and risks associated with nuclear power plants. They influence how pollution dissipates into the environment, as well as the risk of natural events triggering a substantial release of radioactive material. Nuclear power plants can be built in seismically unstable areas. For example, Japan is located in one of the most seismically active regions in the world, yet it currently has 56 nuclear reactors and plans to build another 12 (UMPNERT 2006). However, siting nuclear power plants in seismically unstable areas increases the costs of construction and operation.

Relevant geological and seismological factors include:

- the prevalence and likely magnitude of earthquakes;
- the prevalence and likely magnitude of seismically-induced floods and tsunamis;
- soil and rock stability;
- slope stability; and
- proximity to aquifers and risk of groundwater contamination.

Criterion B.2

Sites with an appropriate geological and seismological profile.

Atmospheric conditions

There are two main atmospheric considerations. The first is whether extreme weather events could affect the safe and efficient operation of the nuclear power plant. Examples of relevant weather events include cyclones and floods.

The second consideration is how atmospheric conditions could affect the dispersion of radioactive material and other pollutants from routine releases and accidents. Relevant factors include prevailing winds, topographical factors that influence local climate (for example, hills and valleys), and risk of local fogging or icing due to water vapour discharge.

Criterion B.3

Sites with low risk of extreme weather events and suitable pollution dispersion conditions.

Security risk

In siting nuclear power plants, operators and regulators will seek to minimise the risk of intentional and unintentional damage to the plant. Protection against terrorism should be paramount in this process.

Factors that are likely to be taken into account in evaluating security risks include proximity to relevant transport infrastructure (for example, airports), hazardous materials and military facilities. The risk posed by these factors could be due to intentional misuse, for example, if an airplane was used as a missile. These factors could also to give rise to unintentional risks like plane crashes or hazardous materials being released that affect the operation of the power plant.

Criterion B.4

Sites with low security risks (e.g. sufficient buffers to potentially hazardous areas).

Sensitive ecological areas

Nuclear power plants should be located away from sensitive ecological areas to minimise potential environmental impacts. These areas include internationally and nationally significant wetlands, important breeding grounds for migratory species, areas supporting threatened species or ecological communities, and important national parks and nature reserves.

Criterion B.5

Sites that pose minimal risk to important ecological areas.

Heritage and aesthetics

Heritage and aesthetic factors should be taken into account in the siting of nuclear power plants. Relevant considerations include proximity to world, national, Commonwealth and state heritage areas and places that are valued by the community for their aesthetic beauty or cultural significance.

Criterion B.6

Sites that pose minimal risk to important heritage areas.

Economic factors

The construction of nuclear power plants can have a substantial impact on the economy of the surrounding area. Potential negative economic impacts include risk of contamination to nearby primary industries (for example, farming and fishing), loss of goodwill to nearby primary industries and tourism, reduction in local property prices (Clark *et al.* 1997), and stress on local labour markets, transport infrastructure and government services (USNRC 1998). These negative impacts should be weighed against potential positive economic effects, including employment opportunities, reliable energy supply, and resulting infrastructure upgrades.

Criterion B.7

Sites that accommodate local economic and social factors.

4. Identifying suitable sites for nuclear power plants

The primary criteria discussed in Section 3 were used to identify the most likely sites for the 12 nuclear power plants that are necessary to meet the Nuclear Taskforce's slow build scenario. The selected sites reflect geographic areas rather than specific locations.

Data limitations prevented a thorough evaluation of the sites against the secondary criteria. However, a preliminary analysis of the secondary criteria was undertaken to identify potential issues at the selected sites. Details of the method employed in applying the secondary criteria are as follows.

- Criterion B.1 – Data from the 2001 census published by the Australian Bureau of Statistics (ABS) was used to determine the population densities of the local government areas (LGAs), statistical local areas, statistical subdivisions, urban centres/localities and/or suburbs in and around the selected areas (ABS 2006). An aerial inspection via Google Earth was then used in conjunction with the census data to determine whether population buffers are likely to be an issue. Generally, population buffers were only recorded as a potential issue where the population of the relevant surrounding area exceeded 120,000 on census night in 2001.

- Criterion B.2 – The Geoscience Australia and Geoscience.gov.au websites were used to identify significant fault lines and folds, recorded earthquakes and earthquake hazard risk around the selected sites. Faults and folds were identified using the 1:250,000 geology maps available on the Geoscience.gov.au website (ACGGC 2006). Recorded earthquakes were limited to those identified on the Geoscience Australia Earthquake Database with a magnitude greater than 4.5 on the Richter scale that occurred within approximately 100 km of the relevant site (Geoscience Australia 2004a). The earthquake hazard was assessed using the Geoscience Australia Earthquake Hazard Risk Contour Map that is available through the Earthquake Database. The map provides a contoured depiction of acceleration coefficients that have a 10 per cent chance of being exceeded in 50 years. Three ranges are provided: >0.10, 0.05 – 0.10, and <0.05. A value of 0.05 means there is a 10 per cent chance the peak ground acceleration will exceed 0.05 in any 50 year period. The higher the value the higher the earthquake risk. To aid comprehension, earthquake risk has been provided as either low (<0.05), medium (0.05 – 0.10) or high (>0.10). These categories only provide a relative measure of earthquake risk in Australia. By international standards, Australia has a low to moderate seismic hazard level. Under the Global Seismic Hazard Assessment Program, earthquake risk is only considered high where there is a 10 per cent chance the peak ground acceleration will exceed 0.24 in any 50 year period (GSHAP 1999). Due to data limitations, no attempt was made to evaluate other geological issues, like soil stability or risk of groundwater contamination.

- Criterion B.3 – Data limitations prevented an evaluation of relevant local atmospheric conditions. Cyclone and flooding risks may be relevant at certain sites.

- Criterion B.4 – Google Earth, Street-Directory.com.au, government websites (DSDT 2006; DTED 2006; DSRD 2006) and information published by Geoscience Australia (2004b) were used to identify major industrial centres, airports and military establishments in the selected areas.

- Criterion B.5 – The Commonwealth Department of the Environment and Heritage's (DEH) EPBC Local Government Area Search website (DEH 2006a) and Australian Heritage Database (DEH 2006b) were used to evaluate matters of ecological significance in the selected areas. These databases are designed primarily to detect matters of national environmental significance, as well as places on the Register of the National Estate (RNE). National parks and state reserves were used as a proxy to identify other ecological issues of state, regional and local significance (although some of these are also of international and national significance).

- Criterion B.6 – DEH's EPBC Local Government Area Search website and Australia Heritage Database were used to identify places of heritage significance in the selected areas (DEH 2006a; 2006b).

- Criterion B.7 – An evaluation of tourism activity in the selected areas was undertaken using data published by the ABS (2003), Tourism Australia

(Bureau of Tourism Research 2003a; 2003b) and relevant state tourism authorities (Tourism Queensland 2006; Tourism New South Wales 2006; Tourism Victoria 2006a; 2006b; 2006c; South Australian Tourism Commission 2006). The focus was on visitation and tourism employment in the areas. Data limitations prevented a more thorough evaluation of potential economic and social impacts.

Using the primary criteria discussed in Section 3, Table 1 details the most likely locations for the 12 nuclear power plants. Issues that were identified with the secondary criteria have been noted in the third and fourth columns. Due to the benefits associated with locating nuclear power plants near existing power stations, the presence of fossil fuel-based power plants in or near the selected sites have been noted in the second column.

Table 1 Potential sites for nuclear power plants

Location	Existing power plants	Earthquake risk*	Comment
Queensland			
Townsville	Yabulu gas-fired power plant (230 MW) and Mt Stuart oil-fired power plant (300 MW) are both located near Townsville.	• Medium earthquake risk. • Three recorded earthquakes. • Faults and folds identified to the south and west of Townsville.	Potential issues with the following criteria. • B.4 – Large strategic military base, airport and industrial sites. • B.5/B.6 – There are a number of important heritage and ecological areas in the area, including the Great Barrier Reef World Heritage Area, Townsville Town Common Conservation Park, Magnetic Island National Park, Bowling Green Bay National Park, Bohle River Fish Habitat Area and Kissing Point Fort Commonwealth Heritage Area. The DEH website indicates that over 45 RNE sites, 30 nationally threatened species and a significant number of listed migratory species are found in the area. • B.7 – The Northern Tourism Region receives around 900,000 domestic overnight visitors, over 1.1 million domestic day visitors and 135,000 international visitors each year. In 2002, it ranked amongst the top 20 regions visited by international tourists in Australia.
Mackay	Mackay Gas Turbine (a 34 MW oil-fired power plant) is located in the western part of Mackay. Collinsville coal-fired power plant (190 MW) is located to the northwest of Mackay.	• Medium earthquake risk. • One recorded earthquake. • Faults identified to the west and southwest of Mackay.	Potential issues with the following criteria. • B.4 – Regional airport and industrial sites. • B.5/B.6 – There are a number of important heritage and ecological sites in the area, including the Great Barrier Reef World Heritage Area, Bassett Basin Fish Habitat Area, Sand Bay Fish Habitat Area and Cape Hillsborough National Park. The DEH website indicates that around 30 nationally listed threatened species and a significant number of listed migratory species are found in the area.
Rockhampton (e.g. around Yeppoon, Emu Park or Keppel Sands)	Stanwell coal-fired power plant (1,400 MW) is located near Rockhampton.	• Medium earthquake risk. • One recorded earthquake. • Several folds and faults identified in the area around Rockhampton, including the	Potential issues with the following criteria. • B.4 – Shoalwater Bay Military Training Area. • B.5/B.6 – There are a number of important heritage and ecological sites in the area, including the Great Barrier Reef World Heritage Area, Shoalwater and Corio Bays Ramsar wetland, Capricorn Coast and Corio Bay RNE Areas, Shoalwater Bay Military Training Area (which is a Commonwealth Heritage Place), Cawarral Creek Fish Habitat Area,

		Tungamull Fault.	Byfield National Park, Keppel Bay Islands National Park, Keppel Sands Conservation Park and MacKenzie Island Conservation Park. The DEH website indicates that 48 nationally listed threatened species and at least 41 listed migratory species are found in the area. • B.7 – The Fitzroy Tourism Region receives over one million domestic overnight visitors, 1.2 million domestic day visitors and 100,000 international visitors each year. In 2002, it ranked amongst the top 25 regions visited by domestic and international tourists in Australia.
Gladstone	Gladstone coal-fired power plant (1,680 MW) is in Gladstone.	• Medium earthquake risk. • One recorded earthquake. • Geological maps not available.	Potential issues with the following criteria. • B.4 – Regional airport and industrial sites. • B.5/B.6 – There are a number of important heritage and ecological sites in the area, including the Great Barrier Reef World Heritage Area, Curtis Island RNE Area, Garden Island Environmental Park RNE Area, Garden Island Conservation Park, and Rodds Bay Dugong Protection Area. The DEH website indicates that 25 nationally listed threatened species and at least 28 listed migratory species are found in the area. • B.7 – The Fitzroy Tourism Region receives over 1 million domestic overnight visitors, 1.2 million domestic day visitors and 100,000 international visitors each year. In 2002, it ranked amongst the top 25 regions visited by domestic and international tourists in Australia. However, Gladstone is not known as a popular tourist destination.
Bundaberg		• High earthquake risk. • Five recorded earthquakes. • Several folds identified in and around Hervey Bay.	Potential issues with the following criteria. • B2 – high earthquake risk. • B.4 – Regional airport, industry sites (mainly associated with food processing) and Wide Bay Military area. • B.5/B.6 – There are a number of important heritage and ecological sites in the area, including the Great Barrier Reef and Fraser Island World Heritage Areas, Great Sandy Strait Ramsar wetland, Burrum Coast National Park, Mouth of Kolan River Conservation Park, Kolan River Fish Habitat Area, Beelbi Fish Habitat Area and Burrum-Toogoom Fish Habitat Area. The DEH website indicates that 16 nationally listed threatened species and at least 11 listed migratory species are found in the area. • B.7 – The Bundaberg Tourism Region receives over 500,000 domestic overnight visitors, 700,000 domestic day visitors and 50,000 international visitors each year. In 2002, the Hervey Bay/Maryborough area ranked amongst the top 20 regions visited by domestic tourists and top 15 regions visited by international tourists in Australia. Most of this tourism is likely to be associated with Hervey Bay and Fraser Island, meaning the tourism industry may not be adversely affected.

Sunshine Coast (e.g. near Maroochydore, Coolum or Noosa)	Tarong coal and gas-fired power plant (1,400 MW) is located at Nanango, approximately 100 km due west of Maroochydore.	• Medium earthquake risk. • Two recorded earthquakes. • Faults and folds identified near Maroochydore and to the north and west of Noosa.	Potential issues with the following criteria. • B.1 – Finding suitable sites with appropriate population buffers may be problematic (approximately 190,000 people were in the Sunshine Coast Statistical Subdivision on census night in 2001). • B.4 – Several regional airports and Wide Bay Military area. • B.5/B.6 – There are a number of important heritage and ecological sites in the area, including the Great Sandy National Park, Great Sandy Strait Ramsar wetland, Morton Bay Ramsar wetland, Noosa National Park, Mount Coolum National Park, Mooloolah River National Park, Noosa-Maroochy Wallum RNE Area and Peregian Environmental Park RNE Area. The DEH website indicates that around 60 nationally listed threatened species and at least 40 listed migratory species are found in the area. • B.7 – The Sunshine Coast Tourism Region receives approximately 2.5 million domestic overnight visitors, 4 million domestic day visitors and 240,000 international visitors each year. In 2002, it ranked amongst the top 10 regions visited by domestic and international tourists in Australia.
Bribie Island area	Tarong coal and gas-fired power plant (1,400 MW) is located at Nanango, approximately 100 km due west of Maroochydore.	• Medium earthquake risk. • One recorded earthquake. • Faults and folds identified to the north and west of Bribie Island.	Potential issues with the following criteria. • B.1 – Finding suitable sites with appropriate population buffers may be problematic (approximately 140,000 people were in the Caboolture Shire Part A Statistical Subdivision and Caloundra South and Caloundra North Statistical Local Areas on census night in 2001). • B.5/B.6 – There are a number of important heritage and ecological sites in the area, including the Morton Bay Ramsar wetland, Bribie Island National Park, Bribie Island Fortifications RNE Area, Pumicestone Passage – Bribie Island RNE Area, and Pumicestone Passage Marine Park. Glass House Mountains National Heritage Place is nearby, although it is unlikely to be affected. The DEH website indicates that a significant number of nationally listed threatened and migratory species are found in the area. • B.7 – The Sunshine Coast and Brisbane are important tourism regions. Bribie Island is a popular tourist destination. Tourism impacts likely to be highly site dependent.
New South Wales			
Port Stephens (e.g. Nelson Bay)	Vales Point coal-fired power plant (1,320 MW) is located south	• High earthquake risk. • Seven recorded earthquakes. • Faults and folds identified to	Potential issues with the following criteria. • B.2 – High earthquake risk. • B.4 – Williamtown Air Force Base and industry sites near Newcastle.

	of Newcastle on Lake Macquarie.	the north of Port Stephens and in and around Newcastle.	• B.5/B.6 – There are a number of important heritage and ecological sites in the area, including the Hunter Estuary Ramsar wetland, Myall Lakes Ramsar wetland, Port Stephens Lighthouse RNE Areas, Williamstown RAAF Base Commonwealth Heritage Area, Corrie Island RNE Area, Port Stephens Estuary RNE Area, Tomaree National Park, Worimi Nature Reserve and Myall Lakes National Park. The DEH website indicates that approximately 46 nationally listed threatened species and at least 49 listed migratory species are found in the area. • B.7 – The North Coast Tourism Region receives around three million domestic overnight visitors, 3.2 domestic day visitors and 145,000 international visitors each year. In 2002, it ranked amongst the top 20 regions visited by domestic and international tourists in Australia. Approximately 7.5 per cent of the region's workforce is employed in tourism.
Central Coast (e.g. near Tuggerah Lakes)	Vales Point coal-fired power plant (1,320 MW) is located on Lake Macquarie and Munmorah coal-fired power plant (600 MW) is adjacent to Tuggerah Lakes.	• High earthquake risk. • Eight recorded earthquakes. • Several faults and folds in the region, including Macquarie and Yarramalong Synclines.	Potential issues with the following criteria. • B.1 – Finding suitable sites with appropriate population buffers may be problematic (approximately 280,000 people were in the Newcastle Urban Centre/Locality and 310,000 people were in the Lake Macquarie and Wyong LGAs on census night in 2001). • B.2 – High earthquake risk. • B.5/B.6 – There are a number of important heritage and ecological sites in the area, including the Wyrrabalong National Park and Bouddi National Park. The DEH website indicates that approximately 46 nationally listed threatened species and at least 32 listed migratory species are found in the area. • B.7 – The Central Coast Tourism Region receives around 1.3 million domestic overnight visitors and three million domestic day visitors each year. In 2002, it ranked amongst the top 20 regions visited by domestic tourists in Australia. Approximately five per cent of the region's workforce is employed in tourism.
Botany Bay		• Medium earthquake risk. • Six recorded earthquakes. • Faults and folds identified in Royal National Park and to the north of Botany Bay.	Potential issues with the following criteria. • B.1 – Finding suitable sites with appropriate population buffers may be problematic (approximately 200,000 people were in the Sutherland Shire LGA on census night in 2001. Large numbers were also present in adjacent LGAs (e.g. Randwick and Botany), although only 2,000 were counted in the suburb of Kurnell). • B.4 – Kingsford-Smith Airport and industrial sites on Kurnell Peninsula. • B.5/B.6 – There are a number of important heritage and ecological sites in the area, including the Kurnell Peninsula National Heritage Area, Royal National Park and Garawarra State Conservation Area National Heritage Area, Towra Point Nature Reserve Ramsar

			wetland and Botany Bay National Park. The DEH website indicates that approximately 50 nationally listed threatened species and at least 33 listed migratory species are found in the area.
Port Kembla	A 400 MW gas-fired power plant is currently being constructed on Lake Illawara at the site of the old Tallawarra power station.	• Medium earthquake risk. • Six recorded earthquakes. • Faults identified near Lake Illawarra (e.g. Macquarie Fault).	Potential issues with the following criteria. • B.1 – Finding suitable sites with appropriate population buffers may be problematic (approximately 180,000 people were in the Wollongong LGA on census night in 2001). • B.4 – Industrial sites and Wollongong Aerodrome. • B.5/B.6 – The DEH website indicates that approximately 59 nationally listed threatened species and at least 38 listed migratory species are found in the area.
Jervis Bay and Sussex Inlet		• Medium earthquake risk. • Eight recorded earthquakes. • Several faults and folds identified near Jervis Bay and Sussex Inlet, including Point Perpendicular Fault and St Georges and Jervis Bay Synclines.	Potential issues with the following criteria. • B.4 – Military base. • B.5/B.6 - There are a number of important heritage and ecological sites in the area, including the Beecroft Peninsula, Jervis Bay Territory, Point Perpendicular and Royal Australian Naval College Commonwealth Heritage Areas and Booderee National Park. The DEH website indicates that approximately 70 nationally listed threatened species and at least 43 listed migratory species are found in the area. • B.7 – The South Coast Tourism Region receives around 2.3 million domestic overnight visitors, 1.8 million domestic day visitors and 60,000 international visitors each year. In 2002, it ranked amongst the top 25 regions visited by domestic and international tourists in Australia. Approximately eight per cent of the region's workforce is employed in tourism.
Australian Capital Territory Jervis Bay		See above.	See above.
Victoria South Gippsland (e.g. Yarram, Woodside,	There are a number of coal and gas-fired power plants in Central Gippsland,	• Medium earthquake risk. • Seven recorded earthquakes. • Several faults and folds identified near Yarram,	Potential issues with the following criteria. • A.1 – System costs may be significant. • B.5/B.6 – There are a number of important heritage and ecological sites in the area, including Corner Inlet Ramsar wetland, Gippsland Lakes Ramsar wetland, Jack Smith Lake

Seaspray)	including Yallourn (1,450 MW), Valley Power (300 MW), Loy Yang A (2,000 MW), Loy Yang B (1,000 MW), Hazelwood (1,600 MW), Jeeralang A (230 MW), Jeeralang B (240 MW), Morwell (195 MW) and Bairnsdale (80 MW).	including Yarram, Napier, Gelliondale and Darriman Monoclines and Toora and Tap Tap Faults.	RNE Areas and Nooramunga Marine and Coastal Park. The DEH website indicates that approximately 62 nationally listed threatened species and at least 45 listed migratory species are found in the area. • B.7 – The Gippsland Tourism Region receives around 1.6 million domestic overnight visitors, 2.2 million domestic day visitors and 50,000 international visitors each year. In 2002, it ranked amongst the top 25 regions visited by domestic tourists in Australia. Approximately five per cent of the region's workforce is employed in tourism.
Western Port (e.g. French Island, Hastings, Kooweerup, Coronet Bay)		• Medium earthquake risk. • 17 recorded earthquakes. • Several faults and folds identified, including the Tankerton, Wellington, Tyabb, Devilbend, Brella and Corinella Faults.	Potential issues with the following criteria. • B.4 – Industrial sites and HMAS Cerberus Naval Base. • B.5/B.6 - There are a number of important heritage and ecological sites in the area, including Western Port Ramsar wetland, HMAS Cerberus Marine and Coastal Commonwealth Heritage Area, Yaringa Marine National Park and French Island National Park. The DEH website indicates that approximately 30 nationally listed threatened species and at least 30 listed migratory species are found in the area. • B.7 – The Mornington Peninsula, Melbourne East and Philip Island Tourism Regions receive a significant number of tourists each year. The Philip Island Region receives around 700,000 domestic overnight visitors, 900,000 domestic day visitors and 30,000 international visitors each year. Approximately eight per cent of the region's workforce is employed in tourism. The Mornington Peninsula receives around one million domestic overnight visitors, 2.8 million domestic day visitors and 30,000 international visitors each year. Approximately five per cent of the Peninsula's workforce is employed in tourism.
Port Phillip (e.g. Newport, Werribee, Avalon)	Newport gas-fired power plant (500 MW) and Somerton gas-fired power plant (160 MW) are both located near Port Phillip.	• Medium or high earthquake risk depending on location. • Ten recorded earthquakes. • Faults identified west of Werribee (Rowsley Fault) and around Geelong (e.g.	Potential issues with the following criteria. • B.1 – Encroaching development and significant populations in the area (approximately 270,000 people were in the Greater Geelong and Wyndham LGAs on census night in 2001. Large numbers were also present in adjacent LGAs). Finding suitable sites with appropriate population buffers may be problematic. • B.2 – Medium/high earthquake risk. • B.4 – Avalon Airport and industrial and military sites.

		Bellarine, Barrabool and Newtown Faults).	• B.5/B.6 - There are a number of important heritage and ecological sites in the area, including Port Phillip Bay and Bellarine Peninsula Ramsar wetland, Point Cook Airbase and RAAF Williams Laverton Commonwealth Heritage Areas, Werribee River RNE Area and Point Wilson/Avalon Coastal RNE Area. The DEH website indicates that approximately 36 nationally listed threatened species and at least 29 listed migratory species are found in the area. • B.7 – The Great Ocean Road Tourism Region receives around 2.5 million domestic overnight visitors, four million domestic day visitors and 150,000 international visitors each year. In the Geelong section of the Great Ocean Road Region, tourism accounts for around five per cent of employment. In 2002, it ranked amongst the top 30 regions visited by domestic tourists in Australia. The Melbourne Tourism Region receives around 6.5 million domestic overnight visitors, 11.5 million domestic day visitors and 1.3 million international visitors each year. In 2002, it was the second most popular region visited by domestic and international tourists in Australia.
Portland		• Medium earthquake risk. • One recorded earthquake. • Faults identified near Discovery Bay (Kentbruck Fault, Swan Lakes/Cape Bridgewater Fault) and Cape Bridgewater (Cape Bridgewater Fault).	Potential issues with the following criteria. • B.4 – Industrial sites. • B.5/B.6 – There are a number of important heritage and ecological sites in the area, including Discovery Bay Coastal Park, Lower Glenelg National Park and Cape Nelson State Park. The DEH website indicates that approximately 56 nationally listed threatened species and at least 28 listed migratory species are found in the area. • B.7 – The Great Ocean Road Tourism Region receives around 2.5 million domestic overnight visitors, four million domestic day visitors and 150,000 international visitors each year. In the Western section of the Great Ocean Road Region, tourism accounts for six per cent of employment. In 2002, it ranked amongst the top 20 regions visited by domestic and international tourists in Australia.
Tasmania			Tasmania's demand for electricity is relatively low and it is not projected to increase substantially in the next 30 years. It is also well serviced by hydroelectric power plants. Given these factors, it is unlikely that a nuclear power plant would be constructed in Tasmania in the short to medium term.

South Australia			
Coastal area near Mount Gambier and Millicent	Ladbroke Grove gas-fired power plant (80 MW) and Snuggery gas-fired power plant (63 MW) are both located in the Mt Gambier/Millicent area.	• High earthquake risk. • Four recorded earthquakes. • Faults identified near Discovery Bay and north of Port MacDonnell.	Potential issues with the following criteria. • B.2 – High earthquake risk. • B.5/B.6 – Important heritage and ecological sites in the area include Canunda National Park and Nene Valley Conservation Park. The DEH website indicates that approximately 12 nationally listed threatened species and at least six listed migratory species are found in the area. • B.7 – The Limestone Coast Tourism Region receives around 550,000 domestic overnight visitors, 630,000 domestic day visitors and 37,000 international visitors each year.
Port Adelaide	Torrens Island A (480 MW) and Torrens Island B (800 MW) gas-fired power plants are located at Port Adelaide. There are several other gas-fired power plants in the Adelaide area, including Pelican Point (478 MW), Osborne (180 MW) and Quarantine (96 MW).	• High earthquake risk. • 12 recorded earthquakes. • Faults identified to the north and east of Adelaide. Faults also identified on the Yorke Peninsula.	Potential issues with the following criteria. • B.1 – Finding suitable sites with appropriate population buffers may be problematic (approximately 210,000 people were in the Port Adeliade/Enfield and Salisbury LGAs on census night in 2001). • B.2 – High earthquake risk. • B.4 – Airport, industrial sites and military area. • B.5/B.6 – There are a number of important heritage and ecological sites in the area, including Point Gawler Conservation Park, Barker Inlet – St Kilda Aquatic Reserve and St Kilda – Chapman Creek Aquatic Reserve. The DEH website indicates that approximately 14 nationally listed threatened species and at least 18 listed migratory species are found in the area. • B.7 – The Adelaide Tourism Region receives around two million domestic overnight visitors, 2.8 million domestic day visitors and 300,000 international visitors each year. In 2002, it ranked amongst the top 10 regions visited by domestic and international tourists in Australia.
Port Augusta and Port Pirie	The Northern (530 MW) and Playford B (240 MW) coal-fired power plants are located at Port Augusta.	• High earthquake risk. • 11 recorded earthquakes. • Faults identified near Mt Grainger, to the northeast of Port Augusta and adjacent to Cowleds Landing.	Potential issues with the following criteria. • B.2 – High earthquake risk. • B.4 – Airports, industrial sites and military area. • B.5/B.6 – There are a number of important heritage and ecological sites in the area, including Winninowie Conservation Park, Yatala Harbour Aquatic Reserve, Blanch Harbour – Douglas Bank Aquatic Reserve, Munyaroo Conservation Park and Whyalla – Cowleds Landing Aquatic Reserve. The DEH website indicates that approximately 20 nationally

			listed threatened species and at least 26 listed migratory species are found in the area.
Western Australia			Excluded because it is not on the NEM.
Northern Territory			Excluded because it is not on the NEM.

*Earthquake risk is assessed using three indicators: Geoscience Australia Earthquake Hazard Risk assessment (2004a); number of recorded +4.5 magnitude earthquakes, and presence of fault and fold lines. For more information on the method used for these purposes, see introduction to Section 4.

5. Implications

If the Federal Government decided to promote the establishment of a nuclear power industry in Australia, the siting of the power plants is likely to be one of the most politically contentious issues. Overseas evidence suggests that even in countries that rely on nuclear power for a large proportion of their electricity needs, there is a considerable amount of community opposition to the nuclear industry and siting issues are often a source of significant conflict.

In Australia, approximately half of the population opposes nuclear energy and two thirds say they would oppose a nuclear power plant in their local area. Given this, in order for there to be a thorough and full-blooded debate about nuclear energy, it is necessary to identify the sites that are best suited to nuclear power plants.

Using four primary criteria, 19 locations have been identified as the most likely sites for nuclear power plants. Seven secondary criteria were then used to identify potential issues at these sites. The selected sites are:

- in Queensland – Townsville, Mackay, Rockhampton, Gladstone, Bundaberg, Sunshine Coast and Bribie Island;
- in New South Wales and the Australian Capital Territory – Port Stephens, Central Coast, Botany Bay, Port Kembla and Jervis Bay/Sussex Inlet;
- in Victoria – South Gippsland, Western Port, Port Phillip and Portland; and
- in South Australia – Mt Gambier/Millicent, Port Adelaide and Port Augusta/Port Pirie.

Further research would need to be carried out before it could be concluded that these areas are definitely suitable for a nuclear power plant. There are also likely to be a number of other areas that could potentially be suitable for a nuclear power plant.

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